RESEARCH AID

CONSUMPTION OF COAL BY THE CHINESE COMMUNIST RAILROADS

CIA/RR RA-29
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CENTRAL INTELLIGENCE AGENCY
OFFICE OF RESEARCH AND REPORTS

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(ORR Project 43.2034)

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FOREWORD

The purpose of this research aid is to evaluate recently published Chinese Communist statistics regarding the rate of coal consumption by road freight locomotives and the total amount of coal consumed by all railroad locomotives in 1956. In order to test these figures, it was necessary to work out new formulas and to derive estimates of the ratio in railroad operations of actual coal to standard fuel, the ratio of fuel consumed by road freight locomotives to the fuel consumed by all locomotives, and the ratio of net tons to gross tons hauled. Several other potentially useful figures were developed as byproducts of the research. It is particularly interesting that the estimates of coal consumed by the railroads can be used as a further validity check on the announced output of freight transportation service of the Chinese Communist railroads.

Because this research represents a new approach to the subject and because the available data are sparse and imprecise, the figures and ratios developed in the research aid are necessarily tentative. Future increases in available data undoubtedly will result in refinement of the figures and ratios herein, but it is believed that there is a sufficient crosscheck to assure that none of them is of the wrong order of magnitude. Suggestions and criticism by other IAC components regarding the content of this research aid are invited.

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CONSUMPTION OF COAL BY THE CHINESE COMMUNIST RAILROADS*

Summary

In 1956 the road freight locomotives** of the Chinese Communist railroads were burning coal at a rate of 151.6 kilograms (kg) of standard fuel per 10,000 gross ton-kilometers (tkm)*** performed, which compares very favorably with a Soviet rate of 196 for the same year. The total amount of coal used by the railroad system for all purposes, including heating of buildings and operation of workshops, was 8.9 million tons, which is a little less than 9 percent of the coal produced in that year.

The combined consumption of coal for all locomotives (freight, passenger, and yard) was 7.4 million tons, from which it is calculated that 5.2 million tons of actual coal, or about 3 million tons of "standard fuel," were burned by the road freight locomotives. At a rate of 151.6 kg of standard fuel per 10,000 gross tkm this is almost exactly the amount needed to produce the 120.4 billion net tkm of freight haulage which Peking announced was performed in 1956.

I. Efficiency of Coal Consumption by Locomotives.

Within the Sino-Soviet Bloc a common measure of efficiency for steam locomotives is "kilograms of standard fuel consumed per 10,000 gross tkm performed." "Standard fuel" is a theoretical concept representing fuel which produces 7,000 kilocalories per kilogram. This concept is useful because it makes possible comparisons of the efficiency in fuel usage by widely scattered enterprises using varying qualities of fuel. In practice, Chinese Communist locomotives burn about 1.7 kg of the average quality of coal used by the railroads to

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* The estimates presented in this research aid represent the best judgment of ORR as of 1 January 1958.

** The term road freight locomotives refers to locomotives which haul freight for considerable distances as opposed to yard locomotives, which operate in a limited area.

*** Tonnages are given in metric tons throughout this research aid.

equal the work production of 1 kg of standard fuel.* A comparison of Chinese Communist and Soviet average rates of coal consumption by road freight locomotives is given in Table 1.

Table 1

Average Rate a/ of Coal Consumption by Road Freight Locomotives in Communist China and the USSR
1950-57

	Communist China		USSR	
Year	Rate a/	Index b/	Rate a/	Index b/
1950	250.0 c/	115	225 d/	104
1951	217.0 c/	100	217	100
1952	195.0 c/	90	211	97
1953	171.7 c/	79	205	94
1954	164.0 c/	76	201	93
1955	156.9 c/	72	194	89
1956	151.6 c/	70	196	90
1957 (Plan)	150.0 e/	69	N.A.	N.A.

a. In terms of kilograms of standard fuel per 10,000 gross tkm performed.

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Table 1 shows that the Chinese Communists have made constant improvement in efficient use of fuel since 1950. The rate of improvement has been decreasing, however, from an annual rate of 13 percent in 1951 to an annual rate of 3 percent in 1956. The planned improvement for 1957 compared with 1956 was only 1 percent.

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It is likely that little further improvement can be derived from the training and motivation of personnel, which have accounted for much of the progress up to this time. The increasing addition of more modern, more efficient locomotives to the total inventory, however, should allow a slight annual improvement for some years to come. A cessation or retrogression of this downward trend would probably indicate a slacking off on the part of the personnel.

It is remarkable that the Chinese Communists were able to match the Soviet performance 2 years after assuming control of the existing railroad system. It is, perhaps, even more remarkable that by 1956 the Chinese rate of coal consumption was nearly 23 percent below that of the USSR. The apparent superiority of the Chinese Communist performance is probably the result of the much more temperate weather in China. Friction and heat-loss increase rapidly as the temperature drops into the subzero ranges, and the rate of fuel consumption rises accordingly. 25X1

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Furthermore, because of the increased loss of heat to the air, the over-all loss in efficiency would be more than 25 percent. During the cold part of the year, therefore, the Soviet steam locomotives would normally be expected to have a much greater consumption of fuel per unit of performance than the Chinese.

Other factors may also be operating in favor of the Chinese. One of these is the fact that the authorities have for 7 years maintained a drive for ever-increasing efficiency in the use of coal by locomotives. This drive has been intensified by the national coal shortage of the past 18 months. In 1956, about 50 percent of the engineers and firemen received various kinds of awards for coal savings. 5/ Similar campaigns have been conducted in the USSR also, but it is possible that their effectiveness is lessened by what could be called mature cynicism in contrast to the initial revolutionary fervor and responsiveness to "campaigns" which still mark the Chinese.

The Chinese Communist figures on rates of consumption can be checked by using the figures given for coal consumed by all Chinese locomotives in 1956 and the total ton-kilometers performed in that year. This method provides only a rough check because it entails the use of several imprecise, estimated factors.* The rate of coal consumption derived by this method is within 2 percent of the rate officially published by the Chinese.

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Considering the current shortage of coal in Communist China and the high level of labor discipline, it is reasonable to expect that no effort is spared to reduce coal consumption by locomotives. Seven years of continuous pressure on the engineers and firemen to economize on coal have evidently been successful. Allowing for some inevitable upward bias in the reporting, it is probable that the actual performance of the Chinese Communist locomotives in the efficiency of consumption of coal is in the neighborhood of the announced figures. It is believed that these figures are reliable enough to be accepted and used with reasonable caution in other economic analyses.

II. Railroads as a Coal Consumer.

About 9 percent of the total coal production in Communist China was used by the railroads in 1956.* In absolute terms, the railroads used about 8.9 million tons, and 83 percent of this, or 7.4 million tons, was burned by locomotives. The rest was used in heating stations, offices, and living quarters; the workshops; and, probably, in railroad-operated thermal electric plants.

For 1955 the available figures are less precise, but the calculated equivalents of the 1956 figures given above are 7.9 million tons total, of which 6.3 million tons were burned by locomotives.

Announced figures for earlier years are scarce, contradictory, and unreliable. Rough estimates of the coal consumed by the railroads in earlier years derived from the rates of consumption in Table 1** are used to complete Table 2.***

As can be seen from Table 2, the increases in the efficiency of coal usage have partly counterbalanced the demands resulting from annual increases in ton-kilometers performed. Thus the increase in coal consumption by locomotives from 1950 to 1956 was only about 80 percent although the net ton-kilometers performed increased 206 percent.

Assuming that 70 percent**** of all the coal used by locomotives is used by road freight locomotives, the figure of 7.4 million tons for 1956 can be reduced to 5.2 million tons for the road freight locomotives. This figure converts to about 3 million tons of "standard fuel," and this is almost exactly the amount that would have been needed for the 120.4 billion net tkm of freight haulage announced for 1956 at an efficiency rate of 151.6 kg of standard fuel per 10,000 gross tkm performed.

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Table 2

Total Coal Consumption by Locomotives and by the Railroad System in Communist China Compared with Net Ton-Kilometers Performed
1950-56

Year	Coal Consumption			Net Ton-Kilometers Performed b/	
	By Locomotives		By the Railroad System		
	Million Tons	Index	Million Tons	Billion Ton-Kilometers	Index
1950	4.1	100	5.1	39.4	100
1951	4.6	112	5.8	51.5	131
1952	4.8	117	6.0	60.2	153
1953	5.5	134	6.9	78.1	198
1954	6.3	154	7.9	93.2	237
1955	6.3	154	7.9	98.1	249
1956	7.4 a/	180	8.9	120.4	306

a. This figure is as announced and is not derived from the rate of consumption.
b. 6/

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